EMMA SUDO

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RESEARCH INTERESTS

I am interested in the intersection of computer systems and formal methods, especially techniques for making verified systems more expressive, efficient, and maintainable.

EDUCATION

Stanford University Sept 2024 – Exp. 2027
BS in Computer Science · GPA: 4.02

Webb Institute Sept 2023 – June 2024
Naval Architecture and Marine Engineering (transferred) · GPA: 4.00

PUBLICATIONS

Continuation-Centric Computing with Arca OSDI 2026
Akshay Srivatsan, Yuhan Deng, Katherine Mohr, ***Emma Sudo****, Sebastian Ingino, Francis Chua, and Keith Winstein.* 20th USENIX Symposium on Operating Systems Design and Implementation (OSDI)*, July 2026.*

PRESENTATIONS

WasmBounds: Eliminating Memory Bounds Checks with Abstract Interpretation Aug 2026
Emma Sudo*. Talk, WebAssembly Research Day.*

WasmBounds: Eliminating Memory Bounds Checks in WebAssembly July 2026
Emma Sudo *and Keith Winstein. Poster, OSDI 2026.*

RESEARCH AND SYSTEMS BUILDING EXPERIENCE

Automated Proof Instability Repair in Verus May 2026 – Aug 2026
CMU REUSE Program, with Prof. Bryan Parno

- Developed a prototype to automate the repair of proof instability in Verus, where semantics-preserving changes to the source program cause previously verified proofs to fail.
- Extended Cazamariposas (CADE 30) by translating its SMT-level repairs into Verus source changes, automating a step previously performed manually.
- Successfully translated 65% of the SMT-level fixes across 12 Verus projects.

WasmBounds Mar 2026 – Present
Independent research, with Prof. Keith Winstein

- Designed and implemented an abstract interpreter using a sign-agnostic strided interval domain to eliminate redundant WebAssembly memory bounds checks.
- Used Verus to prove that the domain's abstract operations soundly overapproximate the corresponding WebAssembly operations, addressing soundness bugs in the domain implementation.
- Investigating a liquid-type proof system that lets compilers preserve safety facts in proof-carrying WebAssembly, reducing the need to reconstruct them through analysis.

wBPF Jan 2026 – Mar 2026
CS244C, with Profs. David Mazières and Keith Winstein

- Led a four-student team developing wBPF, a system for safe kernel extensions with greater expressiveness than eBPF.
- Combined static analysis with runtime checks to enforce termination and memory bounds of WebAssembly-based kernel modules.
- Ran programs exceeding the eBPF verifier's complexity limits and matched eBPF performance on two microbenchmarks.

Research and Systems Building Experience (cont.)

FerrOS Jan 2026 – Mar 2026
CS140E, with Prof. Dawson Engler

- Created FerrOS from scratch, implementing a bare-metal operating system in Rust for the Raspberry Pi.
- Built a WebAssembly System Interface (WASI) layer and ported wBPF to FerrOS, enabling WebAssembly execution with enforced termination and memory bounds.

Fix Jan 2026 – Present
Academic year research, with Prof. Keith Winstein

- Investigated how to verify the implementation of Fix's "coupon collector," a WebAssembly program that certifies equivalence between computations.
- Experimented with Isabelle's code generation feature and identified the size of generated binaries as a limitation.
- Findings informed the group's decision to implement the certifier in WebAssembly and verify it against Fix's semantics using the WasmCert-Isabelle mechanization of WebAssembly.

Arca Sept 2025 – Present
Academic year research, with Prof. Keith Winstein

- Enabled unmodified, off-the-shelf applications to run on Arca, an operating system that introduces continuations as an isolation primitive, by translating WASI calls into Arca system calls.
- Implemented continuation serialization and deserialization, enabling computations to be captured and resumed on a different machine.

Codillon June 2025 – Aug 2025
Stanford CURIS, with Prof. Keith Winstein

- Helped build Codillon, a structured WebAssembly editor that uses typed holes to maintain a syntactically and semantically valid state.
- Contributed to a Rust web framework that uses the type system to make inconsistent DOM and editor states unrepresentable.
- Implemented the core WebAssembly tooling and contributed to the editor's design as a learning tool.

Service

"Informal Methods" Birds-of-a-Feather Session, OSDI 2026 July 2026
Organizer. Brought the systems verification community together to discuss applying formal methods to systems in unexpected ways.

Teaching Experience

CS106A: Programming Methodology, Section Leader Sept 2025 – Dec 2025
Course taught by Nick Parlante

- Led weekly recitation, graded assignments, and provided in-person feedback to 11 students; held office hours for CS106A/B and fixed assignment bugs.

Code in Place, Section Leader Apr 2025 – June 2025
Course taught by Chris Piech and Mehran Sahami

- Led weekly remote lessons for 10 introductory CS students from around the world.

Work Experience

Production Intern, Colonna's Shipyard Jan 2025 – Feb 2025

- Worked in the rigging shop helping repair several U.S. Navy and Coast Guard vessels.

Honors and Awards

- **Tau Beta Pi Candidate** 2026
  Top 20% of seniors in Stanford's School of Engineering based on GPA.
- **OSDI Student Grant** 2026